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OFFICE OF CENTRAL REFERENCE

29 January

MEMORANDUM FOR: Deputy Assistant Director/AD/CR

SUBJECT: 360 Computer vs. Unit Record  
Equipment in Machine Division

Pursuant to your request I have made a hurried attempt to look into the application of a series 360 (360-20 card computer or 360-30 or larger) computer for Machine Division. As you know there is a big gap between OCR's present manual/machine methods and the complete automation of the whole reference functions. In reviewing the system we did not make a complete Feasibility Study to determine the depth of indexing needed, or whether it is more practical to record clear text or coded data, or if dissemination should be computer controlled. (DIA is experimenting with automatic dissemination).

Our present day punch card system covers all types of information storage and retrieval processes, requests are filled daily on continuing requirements, dictionaries are built, indices are maintained, and accounting procedure are practiced and processed, etc. The Machine Division for several years has fully recognized the advantages the more advanced electronic equipment and application have over our present method of machine controlling information. More important, a few years back we initiated an internal study to measure the relative merits of several computer developments then underway and to determine what changes were necessary for us to make so that in the future we could take full advantage of the potential of these machines. As a direct result of this study we changed methods of machine coding and modified our procedures, flow charts, etc, to conform with standard computer practice. Also we have encouraged and tried to elucidate the need for expanding our current concepts of indexing and classification of information. Even more recently the Division has organized and recorded its thoughts regarding the adoption of a 1400 series computer for future automation of our current programs. We have three computer programs operational to date, with two other programs in their final stages of de-bugging.

In appraising the suitability of the 360 series computer for replacement of our Unit Record Equipment we found some of the more important advantages to be:

- a. Variable record length.
- b. Special characters (28) in addition to the alpha-numeric (an increase of sixteen characters over our present unit record equipment).
- c. Storage (Magnetic tapes and Disk).
- d. Updating during print-out, reflecting current transactions.
- e. Editing of information on each step of a process, checking validity of input with capacity to list out incorrect entries.

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- f. Additional logic, with ability to branch to subroutines or other programs.
- g. Ability to multiply and divide while updating the records.
- h. Reduction of space occupied.
- i. Table lookup facility with capability to record and retrieve data either random or sequentially.
- j. Communications lines can be attached directly to the system and information can be received or transmitted at remote locations.
- k. System compatibility ensures growth to larger model computers if needed.

One of the more versatile features of the 360-20 card equipment is its (multi-function machine) ability to update a record, duplicate the record, print the new transaction, and interpret the card (record) in one pass through the machine. The development of these improved updating techniques has made it possible to reduce the work load on key punch operation by having only to punch the indentifiable and new or changed information affecting the record. Other integral features of the equipment that will be directly applicable to our needs are additional logic and speed of printing. (I feel the up dating feature makes the card computer a practical application for the first time).

The 360 tape computer has many advantages in addition to the ones mentioned above. All of our multiple card records could be combined into one. With a variable length record more clear text could be recorded, saving the professional analyst from abbreviating titles, organization, profession, etc. A good portion of his clerical efforts could be shifted to the computer, key punch operators and clerical personnel. The computer could maintain his dictionary, comparing all new accession or changes against the dictionaries to determine if they are a valid entry. All valid entries would be accepted by the computer. The invalid changes or new accession would require human judgment to determine the correct spelling or if the new accession should be added to the dictionaries.

The following programs and the characteristics of these programs (their volume, degree of urgency, amount of updating and length of record) appear to be particularly suited to computer application and hold promise of advantages over the present Unit Record application.

The existing punch card system for ER consist of 16 different card file and file arrangement. There is a need for a much greater record length. The ER dossier program alone requires six cards in order to create a useful end product. We are required to record duplicate cross reference information into each of the six files. To update the record with new information or made changes to the existing record, we have to reconstruct the complete record.

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The same problems that exist in the BR projects exist in the LY's Publication Procurement program, FIB's programs, CGS's Requirement Register and Travel Folder program, and all of GR's programs with the exception of their motion picture index. The length of record exceeds the present comparing capability of the updating and printing equipment and updating requires excessive punching of cross reference information.

The monthly rental for system 360 Model 20 begins at \$1,280.00 with purchase price beginning at \$62,710. The monthly rental for a system containing the multi-function card machine begins at \$1,715. and cost \$82,550. Deliveries are scheduled to begin in the first quarter of 1966.

360/20  
Individual Units of the System and Prices

<u>Model No.</u>	<u>Description</u>	<u>Purchase Price</u>	<u>Monthly Rental</u>
2020	Central Processor 4,096 Core Storage	\$24,300	\$500
	Central Processor 8,192 Core Storage	33,600	700
2560	Multi-Function Machine, Reads 500 cards/min; punches 160 cols/sec	36,200	725
2501	Card Reader, 600 card/min also available @ 1000 card/min	11,700	215
1442	Card Punch, 160 Columns/sec	14,250	285
1403	Printer, 120 print position @ 600 LPM also available with 132 print position	43,950	875
2203	Printer, 120 print position 300 - 750 LPM Also available with 144 Print Position	25,750	565

NOTE: The 360 Model 20 is designed to meet the needs of small size businesses. There are several features available at an additional cost and some would be required if we install the most efficient operation, however, with all the frills added, one set of equipment would not meet our requirement.

As mentioned before our present system covers all types of information storage and retrieval on a limited scale and with more powerful equipment it is

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just a matter of expanding the system to other areas. The size of the computer and the extent of other hardware in the system will be the determining factors as to how much the system can be automated.

The installation of a computer in Machine Division can be immediately established without affecting the experience gained by the Chive Staff. The computer, though requiring some expenditure of time for programming, will in the end provide an excellent training base for future computer operations.

Elimination of the Unit Record equipment will provide adequate space for installation of the computer, however, the present electric supply will have to be augmented. There will be some expense accrued in providing this additional power. Present air condition is fully adequate.

RECOMMENDATION:

That a letter of intent be placed with IBM for one 360/30 computer, as outlined in Attachment B.

  
Chief, Machine Division

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Ability of Various Systems to Meet Our Needs

<u>Desired Characteristic</u>	<u>TYPE OF SYSTEM</u>		
	<u>Present Unit Record Equipment</u>	<u>Card Computer 360-20</u>	<u>Tape Computer or Larger 360-30</u>
Visual access to data	excellent	excellent	none
High-speed searches and selection for five items or less	excellent	good	poor
Multiple - Characteristic searches and selection high volume	poor	fair	excellent
High Speed Printing	fair	good	excellent
Variable record length	poor	poor	excellent
Updating Records	poor	excellent	excellent
High Speed Printing while Updating Records	none	excellent	excellent
Ability to create cross reference files	poor	excellent	excellent
Additional Special Characters	none	poor	excellent
Ability to Multiply and Divide	fair	excellent	excellent

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ATTACHMENT B

PROPOSED 360-30 DATA PROCESSING TAPE SYSTEM

<u>MODEL</u>	<u>DESCRIPTION</u>	<u>MONTHLY RENTAL</u>
2030	Central Processing Unit: 8192 Bytes of Core Storage	\$ 700.00
1402	Card Read Punch Read 1,000 CPM, Punch 250	660.00
2401	60/KC Mag Tape Unit 4 units @ \$485.00 each	1,740.00
2821	Control Unit \$970.00 Column Binary \$100.00	1,070.00
1403	Printer	775.00
1416	Interchangeable Train Cartridge Chain	175.00
1051	Control Unit	70.00
1052	Printer Keyboard	<u>65.00</u>
Total Monthly Rental		\$ 5,255.00

UNIT RECORD EQUIPMENT TO BE ELIMINATED

<u>MODEL</u>	<u>MACHINE</u>	<u>NUMBER OF MACHINES</u>	<u>MONTHLY RENTAL</u>
519	Document Originating Machine	3	\$ 492.00
557	Alpha Interpreter	1	231.00
088	Collator	3	1,425.00
188	Alpha Collator	1	645.00
407	Accounting Machine	2	1,745.00
084/083	Sorter	5	393.00
024	Key Punch Machines	3	120.00
056	Verifying Machines	2	<u>106.00</u>
Total Monthly Rental			\$ 5,157.00
Additional Cost Per Month			94.00

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